

Claims

1. A method for continuously treating the surface
5 of an elongate object, for example a fiber, a wire or
yarn, a tubular component, a ribbon, a strip or the like
by means of a plasma flux created by an electrical
discharge under ambient pressure, in which said elongate
10 object is made to travel continuously through a channel
provided inside a hollow tubular body, that is at least
partially open at its two ends, along an axis of travel
substantially parallel to the longitudinal axis of said
channel, in which, in this method, a neutral plasma flux
15 is generated by means of an electrical discharge
generated by a voltage applied between a central
electrode and ground, said neutral plasma flux being
generated at a set angle with respect to said
longitudinal axis in at least part of said body of the
channel and in which said plasma flux is substantially
20 confined inside this part of said body of the channel, at
least while said elongate object passes through this part
of the body of the channel.

2. The method as claimed in claim 1, in which said
25 plasma flux forms an acute angle with respect to said
axis of travel of said elongate object (A).

3. The method as claimed in claim 1, in which at
least said part (10) of said body (2) of the channel (1)
30 is put into fluid communication with the outside
atmosphere.

4. The method as claimed in claim 1, in which said
electrical discharge is generated by an electric voltage
35 chosen from the group of voltages consisting of direct,
pulsed or alternating voltages with any frequency ranges.

5. The method as claimed in claim 1, in which said plasma flux is generated by means of a supply duct (8) connected to said part of said body of this channel.

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6. The method as claimed in claim 1, in which said plasma is maintained by at least one carrier fluid injected into a device generating said plasma.

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7. The method as claimed in claim 6, in which said plasma is maintained by means of a carrier fluid that contains a plasmo-chemical treatment component in an injectable form.

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8. The method as claimed in claim 7, in which said injectable form is a gas, a vapor, a mixture of gas and vapor, or a compound comprising a fluid vehicle containing gaseous or solid particles or a mixture of these particles.

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9. The method as claimed in claim 1, in which several parts of the body of the channel are defined, in which several plasma fluxes are generated at set angles with respect to the longitudinal axis of this body of the channel, in which said plasma fluxes are substantially confined respectively inside said parts of said body of the channel, and in which said plasma fluxes are maintained respectively with specific carrier fluids.

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10. The method as claimed in claim 1, in which the elongate object (A) is made to move in said channel (1) at a speed extending from a few centimeters/second to several tens of meters/second.

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11. A device for continuously treating the surface of an elongate object, for example a fiber, a wire or

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yarn, a tubular component, a ribbon, a strip or the like
by means of a plasma flux created by an electrical
discharge under ambient pressure, comprising a channel
(1) provided inside a hollow tubular body, that is at
5 least partially open at its two ends, arranged so as to
allow said elongate object (A) to pass along an axis of
travel substantially parallel to the longitudinal axis of
said channel, in order to implement the method of any one
of claims 1 to 10, in which this device (100) comprises
10 means for generating a neutral plasma flux by means of an
electrical discharge generated by a voltage applied
between a central electrode and ground, means for
generating said neutral plasma flux at a set angle with
respect to said longitudinal axis in at least part of
15 said body of the channel (1), and means for confining
substantially said plasma flux inside this part (10) of
said body of the channel, at least while said elongate
object (A) passes through this part of the body of the
channel.

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12. The device as claimed in claim 11, in which
said means for generating a plasma flux at a set angle
with respect to the longitudinal axis of said body of the
channel comprise a plasma-generating device (3) provided
25 with a supply duct (8) connected to said channel (1) in
said part (10) of said body of this channel, this supply
duct forming an angle with the axis of travel of the
elongate object (A).

30 13. The device as claimed in claim 12, in which the
plasma-generating device (3) is arranged so as to produce
the plasma flux with the aid of an electrical discharge
made between an electrode (4) and said part (10) of the
body (2) of the channel (1), this plasma flux being
35 substantially confined between the inner walls of this
part (10) of the body of said channel.

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14. The device as claimed in claim 12, in which the supply duct (8) of the plasma-generating device (3) makes an angle with the axis of travel of the elongate object (A) of between 0 and 90 degrees and preferably between 30 and 60 degrees.

15. The device as claimed in claim 11, in which the channel (1) is provided in a tubular body (2) made of a material resistant to the temperature of the plasma flux.

16. The device as claimed in claim 11, in which the channel (1) is provided in a tubular body (2) made of a material having good thermal conductivity, and in which the outer wall of said channel (1) is cooled.

17. The device as claimed in claim 11, in which the plasma flux is generated in a laminar manner and so as to attain a speed of propagation of the plasma equal to or greater than that of the travel of the elongate object (A).

18. The device as claimed in claim 11, which includes means for making said elongate object (A) move at a speed extending from a few centimeters/second to several tens of meters/second.

19. The device as claimed in claim 11, which comprises two plasma-generating devices (3) oriented so as to direct the plasma fluxes in opposite directions.

20. The device as claimed in claim 11, in which said channel (1) includes separating means (12) arranged so as to cut off the interior of said channel (1) from the outside atmosphere.

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21. The device as claimed in claim 12, in which said supply duct (8) of the plasma generator (3) is associated with a duct (9) for injecting carrier fluid.

5 22. The device as claimed in claim 11, in which said channel (1) comprises several parts (10a, 10b), as well as several plasma-generating devices (3) arranged so as to generate several plasma fluxes at set angles with respect to the longitudinal axis of said body of the
10 channel, said plasma fluxes being confined respectively inside said parts (10a, 10b) of said body of the channel and each of said respective plasma fluxes being maintained with specific carrier fluids.

15 23. The device as claimed in claim 11, in which said channel (1) comprises means (13, 14, 15) for enabling it to be subjected to a partial vacuum or to a controlled atmosphere.

20 24. The use of the method as claimed in one of claims 1 to 10 for modifying the physical properties of the surface of a filamentary object.